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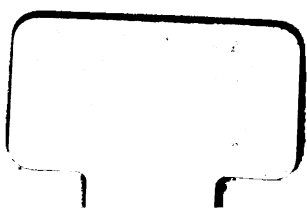
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Board of Harbor Commissioners  
Report  
1868

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THIRD ANNUAL REPORT

OF THE

Board of Harbor Commissioners.

JANUARY, 1869.

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# Commonwealth of Massachusetts.

## REPORT.

*To the Honorable the Senate and the House of Representatives  
of the Commonwealth of Massachusetts.*

In accordance with the provisions of section 8, chapter 149 of the Acts of the year 1866, the Board of Harbor Commissioners beg leave to submit their Third Annual Report.

### PLAN FOR THE OCCUPATION OF SOUTH BOSTON FLATS.

8/6  
The existing plan for the improvement of the South Boston Flats in its main features was developed by the United States Commissioners on Boston Harbor, representing in Professor Bache, the Superintendent of the Coast Survey, Gen. Totten, and after his decease, Gen. Delafield, Chief Engineers of the United States Army, Rear-Admiral Davis, of the United States Navy Observatory, and Mr. Henry Mitchell, Consulting Engineer to the Commission, scientific and engineering ability of the highest character in the country. A series of annual reports made to the city of Boston, gave the elaborate investigations and studies of Boston Harbor, out of which the plan for the occupation of the South Boston flats was matured. Their investigations led them to recommend, from a purely physical point of view, and as benefit to the tidal system of the harbor, the construction on the easterly line of Fort Point Channel and the south-westerly margin of the main channel, of a sea-wall of solid masonry to prevent the dispersion of tide-water over the flats, and by its concentration in the main channel along the wall, counteract a tendency to shoaling that now exists there.

The attention of these Commissioners having then been called

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to the question of the occupation of these flats for business, and the importance of making them available for such purposes, they made investigations to ascertain the conditions upon which this could be done with safety. The displacement from the upper harbor of the immense volume of tide-water which at every tide floods the hundreds of acres of these flats and helps to keep the harbor channels open, and the reduction of scouring force that must be the necessary result of such displacement, were insuperable objections in their minds to the scheme of occupation, unless compensation for such displacement could be secured by making available elsewhere for scour, an equally effective volume of tide-water.

Upon this necessity of compensating for any tide-water displaced in the upper harbor of Boston, we quote their emphatic and imperative language. "The filling up of a portion of the harbor near the mouth, in this particular case, would, perhaps, be locally of no measurable injury, and would deprive the main avenue leading to the sea of so little scouring power that no sensible effect would ever follow; but higher up towards the head of the harbor the same displacement would deprive the entire avenue below it of an element of scouring power which it cannot everywhere or as a whole afford to lose. The upper harbor of Boston, because of the local value of its main channel, and because of the indirect value of its tidal volume to adjacent portions of the lower harbor channels, *cannot, in our opinion, afford to lose another cubic yard of tide-water.* If the application of the compensation rule involves expenses exceeding the benefits to be derived in the most desirable project of occupation, still, we repeat, the harbor cannot afford the loss of tide-water. We do not doubt that the business facilities of your city may be improved by the occupation of flats at various points, but can you or your successors afford to see the smallest additional injury inflicted upon the channel, which some of your clipper ships cannot now traverse till helped over its bars by the rise of the tide, and then only with the aid of a fair wind or a steam-tug? You ask us to advise you in the conservation of your harbor, and we recommend as a matter of primary importance to this end, that you solicit of the legislature the passage of a law *prohibiting any further displacement of the upper harbor tide-water without compensation.*"

The system of compensation devised by the United States Commissioners as inseparable from any plan of occupation, provided that the volume of water displaced from the flats of South Boston should be transferred to Charles River, Mystic River and Chelsea Creek, by extensive excavations between high and low water mark in those tidal reservoirs. In 1866, by chapter 149 of the Acts of that year, the Commonwealth adopted these recommendations of the United States Commissioners, by passing a law establishing the Board of Harbor Commissioners, and requiring compensation for all tide-water displaced by structures built under subsequent grants of the legislature, in the upper harbor of Boston. By chapter 81 of the Resolves of the same year, the Commonwealth adopted the plan for the occupation of the South Boston flats, made in accordance with the views of the United States Commissioners and presented to the legislature of 1866 in the report of the State Commissioners on harbors and flats; a copy of this plan with the modifications of the same since authorized and made, is annexed to this Report. The execution of it requires the construction of a sea-wall on the easterly side of Fort Point Channel and along the margin of the main channel to Castle Island, the extension of the wharves on the westerly side of Fort Point Channel at the mouth on the lines laid down, and the filling solid of all the flats inclosed by the sea-wall, except what shall be reserved for docks opening out upon the main channel, and for a channel-way, so long as it is deemed advisable, on the line of riparian ownership, to give convenient access to the land of the shore owners. The same legislature that established this Board and enacted the law which it was to administer, instructed it to report to the following legislature the probable cost of the filling and the building of the wall, wharves, streets, and sewers required by the plan; "also the probable expense of making compensation for tidal water to be shut out by the filling of said flats; also to ascertain and report on what terms and conditions the said walls, wharves, streets, sewers, or any part thereof can be built by any corporations or individuals, and on what terms and conditions the said flats or any part thereof can be filled, and on what terms and conditions the said flats or any parcels thereof can be sold to any corporations or individuals, either for money or for filling other portions of said flats, and in what



places and manner compensation for the tide-water shut out by filling said flats can best be made, and on what terms and conditions persons whose lands are to be affected by said compensation will give authority to make the same \* \* \* \*, the said commissioners in all plans and proposals submitted by them always regarding the protection and improvement of the harbor of Boston as of paramount importance in any intended occupation of said flats \* \* \* \*; provided that compensation for all tide-water excluded by carrying into effect these resolves shall be duly made as provided in the act to establish a Board of Harbor Commissioners \* \*; provided that no money shall be paid from the treasury of the Commonwealth; provided also that nothing shall be done under this resolve which shall conflict with the plan of the South Boston flats accompanying the report of the Commissioners on harbors and flats of the Commonwealth of Massachusetts, presented to the legislature on the sixth day of January in the year 1866, or which shall conflict with the reports of the United States Commissioners."

The Board reported in accordance with these instructions, to the legislature of 1867. No offer to purchase the flats could be obtained. The only terms of a contract for carrying out the proposed improvement, which the Board was able to obtain, were those arranged with the city of Boston, though not finally agreed to, and these terms were communicated to the legislature. Under them the whole territory, comprising some 750 acres, was to be conveyed to the city of Boston, on condition that the city should carry out the improvement on the plan adopted by the Commonwealth, make the requisite compensation for displaced tide-water, by excavations on Chelsea Creek, Charles and Mystic Rivers, pay into the State treasury one hundred thousand dollars, and ten per cent. of the net profits of the improvement, for the benefit of all the harbors throughout the State, except that of Boston, and hold the remaining ninety per cent. of the profits and the income of the same, as a fund to be applied for the benefit of the harbor of Boston. The estimated cost of dredging and excavations for compensation alone for the first two sections, as recommended by the U. S. Commissioners, amounted to nearly two million dollars.

The legislature of 1867, however, preferred that the Com-

monwealth should retain the control in the execution of this improvement, and accordingly authorized this Board, subject to executive approval, to contract for the construction of a "continuous" sea-wall as far as Slate Ledge, noted on the annexed plan, upon a location to be fixed by an engineer to be appointed by the Governor. This was the least extent of wall which, in the opinion of the United States Commissioners, could be built without injury to the harbor. Two hundred thousand dollars were appropriated for its construction. The same legislature also appointed a committee of nine of its members, with full powers to carry out the proposed improvement by any contracts payable in land or flats, which should not take money from the treasury of the Commonwealth; and in relation to compensation, provided "that said committee shall neither fill nor make any contract for the filling of any portion of said flats, nor allow the same to be filled by any person or persons without first providing for such compensation for tide-water displaced as may be necessary for the protection and preservation of the harbor of Boston," &c. In consequence of the inadequacy of the appropriation for the construction of a "continuous" sea-wall, according to the specifications of the State engineer, and heavy enough for the location finally fixed by him, no contract was made by the Board. The legislative committee in the course of their investigations, came to the conclusion that the legislation then existing did not furnish a satisfactory basis for the prosecution of the work, and they too made no contracts.

Although no wall was built or filling done in the year 1867, much was accomplished by way of developing a plan of operations for the execution of this improvement. Impressed with the magnitude of the incumbrance upon the scheme for the occupation of the South Boston flats, imposed by the obligation to compensate for displaced tide-water by enlarging tidal reservoirs of the harbor according to the plan of the United States Commissioners, which was adopted by the legislature of 1866, and which by the legislation of that year the Harbor Commissioners were enjoined to adhere to, the Board determined soon after the adjournment of the legislature of 1867, to make a new investigation for the purpose of ascertaining whether this method of making compensation was the best and most economical that could be devised, and whether some other solution of this prob-

lem of compensation could not be worked out. This investigation was conducted by the United States Advisory Council, and the result was to relieve this great undertaking of the principal obstacle that stood in the way. The United States Commission had declared that as a preliminary step to the excavations to be made in Mystic and Charles Rivers, an improvement of the outlets would be indispensable. The encroachment of wharves and bridges on the mouths of these rivers had already made them insufficient for the free course of the water flowing through them. The obstruction of these outlets, and the increased velocity induced by this reduction of the outlets, had caused the mud and sand to be swept by the current in large masses from their beds, and carried into the harbor. To make these avenues sufficiently large for an increased flow of tide-water, without further disturbance of the beds, either the wharves and bridges must have been in part removed, or artificial excavations must have been made in anticipation of the new regimen to be induced by the introduction of the compensating volume of tide-water. Either mode of *preparing* for the adoption of a system of compensation in kind would involve a large expenditure of money to be added to the expense of compensation itself. It was estimated that "the expense of a proper transfer of the tide-water from South Boston flats to interior basins would exceed the cost of removing all the bars and shoals from the main channel, and the further cost of maintaining the channel in its improved condition forever." The Board, therefore, in their report to the legislature of 1868, recommended that, instead of expending vast sums upon these reservoirs and their outlets, and waiting many years for improvements to develop themselves in the harbor below, the expenditure should be made directly upon the main channel, especially as every shovelful of earth taken from the bed of the channel would be available for filling upon the flats. They made, therefore, the following proposition: "As soon as the wall has sufficiently advanced to offer proper protection to the filling, dredging shall commence in the main channel, and the material be used for reclamation, until the flats in front of the wall are wholly removed to the depth of twenty-three feet at mean low water, and the anchorage shoal also excavated to the same depth; and furthermore, from the profits arising from

the sale of reclaimed flats the sum of \$500,000 shall be funded and the interest used in repairing the damages which may arise from the reduced tidal volume and in maintaining the depth generally of the main channel." On the plan annexed to this Report, the space in the main ship channel colored red indicates the shoal ground to be removed; and if to this is added the amount of material in the upper middle, which the United States government has provided for removing from the space designated on the same plan, and which will be available for filling also, a total of 3,233,000 cubic yards is obtained, sufficient to fill to grade 13, or 3 feet above mean high water, about 6,380,000 square feet of flats.

This scheme does not violate the principle of compensation insisted upon by the United States Commissioners. It merely secures the object of compensation by other means. The object of compensation is the maintenance of the scour. Under this plan, the scouring force is the dredging machine instead of the current of water. The United States Advisory Council accepted this plan of compensation in the following opinion communicated to this Board:—

"We are satisfied that your proposition to use in the reclamation of the 'first section' of South Boston Flats, material dredged from the borders of the main channel to the extent that may be required for the removal of the anchorage shoal and the flats lying beyond the 'quay line' of the United States commission to the depth of twenty-three feet at mean low-water, and to the total amount of 3,233,000 cubic yards, may be accepted as adequate 'compensation,' *provided*, that from the profits of this reclamation, a fund shall be reserved which shall be sufficient to yield an annual interest of not less than \$25,000, to be expended by your Board in maintaining the depth gained in the main channel, and in preserving the present depths elsewhere in this channel.

"A. A. HUMPHREYS,

*Brig. & Bret. Maj. Gen. U. S. A. Chief of Engineers.*

"BENJAMIN PEIRCE,

*Superintendent U. S. Coast Survey.*

"HENRY MITCHELL,

*Assistant U. S. Coast Survey.*

"UNITED STATES ADVISORY COUNCIL to Board of Harbor Commissioners of Massachusetts."

The excavation in this manner of the anchorage shoal and the flats in front of the wall, and the use for filling section 1 of the material so obtained give, at the same time, an addition to Boston of over two hundred acres of land available for railroads, manufactures and commerce, and to Boston Harbor, some two hundred acres of deep anchorage ground. The execution of the whole improvement by taking the material from the bottom of the harbor and using it for filling, will give an addition of some five hundred acres of deep-water anchorage to the harbor of Boston. Upon this satisfactory basis, as regards compensation and material for filling, the legislature of 1868, by chapter 326 of the Acts of that year, placed the prosecution of this work. The Board of Harbor Commissioners was authorized by that Act, subject in all things to the approval of the governor and council, to contract for the sea-wall and the execution of the whole or any part of the work of improvement and make any bargains in relation to this territory that would not take money out of the treasury of the Commonwealth, beyond the unexpended balance of the appropriation made in 1867 for the sea-wall. The legislature did not provide for the formation of a fund from the proceeds of this undertaking to remedy any shoaling or other injuries that may result from the great displacement of tide-water involved in this work, but it gave what is equivalent to a fund, the pledge of the Commonwealth that, "if it shall appear from hydrographical and physical surveys that injury to the harbor has resulted from the work herein authorized, then such injury shall be repaired by dredging or otherwise in such manner and to such extent as the legislature shall hereafter determine."

We have given this sketch of the legislation upon the subject of this improvement, to facilitate investigation of its history since the establishment of this Board, and to show the principles that have been steadily maintained by successive legislatures in their dealing with the work. The experience of the last year, has shown that the existing basis of legislation is sufficient to secure the execution of as much of the work as can be done in the course of three or four years, to yield a profit to the Commonwealth sufficient to defray all expenditures, to remedy all injurious consequences to the harbor that may result from the work, and leave a balance in the treasury.

Whether greater risks shall be incurred by the Commonwealth in the hope of putting more money into the treasury, is a question which it is for the legislature to decide, and upon which it is hardly within our province to advise.

#### CONTRACTS CONCERNING SOUTH BOSTON FLATS.

Immediately after the passage of the Act of 1868, chapter 326, giving to the board authority to contract in the name of the Commonwealth with any person or persons, or with the city of Boston, for the filling of any portion of the lands or flats in Boston Harbor which lie northerly of South Boston and easterly of Fort Point Channel, and within the exterior line laid down on the plan for the occupation of the flats owned by the Commonwealth in Boston Harbor, approved by the legislature in the eighty-first chapter of the Resolves of the year eighteen hundred and sixty-six, and for building wharves, docks, sea-walls, basins, streets, bridges or sewers, and for dredging or doing any work upon or in relation to said flats, and to pay for the same by conveyances of any portion of said flats, or the granting of any rights or privileges therein, advertisements were made for proposals for filling the first section and building a sea-wall, and negotiations entered into which resulted in four contracts, which were laid before the governor and council on the 14th day of August. The character of and the reasons for presenting these contracts were stated in communications to Governor Bullock.

The first contract was with the Boston Wharf Company. By chapter 450 of the Acts of the year 1855 a license was given to the company by the legislature, to occupy about forty acres of flats, in such a position on Fort Point Channel as to deprive the State of convenient access to its own property beyond. As nothing had been done under this license, the legislature of 1867, by section 4 of chapter 354 of the Acts of that year, repealed it; and the legal question as to the constitutionality of the repeal is pending before the supreme court. By this contract, a compromise was made by which the Boston Wharf Company were to release to the State, in consideration of a perfect title to the balance, in flats and rights of wharfage, what the Board considered equal or equivalent to about one-half of the disputed territory. The division of the flats, as proposed, is shown on the annexed plan.

The second contract was for the construction of a wall of about 700 feet in length on Fort Point Channel. As this was to be set back twenty-seven feet from the channel and protected, whenever used, by a platform, one built upon piles, (similar to that of the Boston Wharf, which has stood for many years,) and costing only \$33 a running foot, was deemed to be sufficient. This wall, as well as the next, was awarded to the Rockport Granite Company and Messrs. Clapp & Ballou, and is similar to the one agreed to be built by the Boston Wharf Company on this territory under their contract.

The third contract was for a sea-wall on the main channel. The Act of the legislature provides that, as a method of compensation, portions of the harbor shall be dredged to the depth of twenty-three feet at low water. The foundation of the wall must therefore be laid at that depth, and be of strength sufficient to stand against storms on one side and the pressure of material on the other. As any imperfection in this work might lead to most serious results, by precipitating a vast amount of material into the harbor, to its great injury, the Commission asked the advice of Major-General J. G. Foster, George R. Baldwin, James B. Francis and T. Willis Pratt, four engineers of the highest character and greatest experience in structures of this nature. The Board submitted seven different plans for a wall, and asked them to recommend the cheapest structure that in their opinion would be sufficient for the purpose. After several consultations they unanimously recommended the plan that was submitted to the governor and council. On the eleventh day of July the Commissioners advertised for proposals for construction of a wall on this plan, which were opened on the third day of August. They received four bids: two for \$17.50, one for \$12.00 and one (which was accepted) at \$11.40 a yard laid, which would amount to \$189 a running foot. As the wall had to be laid by means of submarine divers at the depth of 23 feet at low water of dimension stones without pinnars, this was thought to be as good an offer as any responsible bidders could be expected to make. In addition to this, the Commissioners undertook that the contractor for filling the flats should excavate to the depth of 23 feet at low water and prepare, a level bed for the reception of the masonry.

Such a wall could not be built except at a great expense ;

the resources at the command of the Commissioners were \$193,000, the balance of an appropriation made in the year 1867 of \$200,000, and the right to pay for the same in land or flats. The Commissioners felt certain from the bids received that with the cash appropriation they could build the 700 feet of wall of the first contract and nine hundred and five feet of that provided for in the second, and that the balance could be paid for in flats or filled land, without calling on the legislature for any further appropriation.

Having thus provided for the exterior wall, the Commissioners advertised for proposals for filling any portion of the flats inclosed, the contractor to be paid by receiving either flats unfilled or a portion of those that were embraced in his contract; this being the mode of payment provided by the legislature.

But one bid was received in response to the advertisement, and this was made by N. C. Munson, well known as the contractor for filling the Back Bay lands, and many other important works,—a man believed to be perfectly able to carry out any contract he might undertake. He offered within three years to fill, with material dredged from the bottom of the harbor, at such points as the Commissioners should direct, and with a surface covering of three feet of clean gravel, 4,660,870 (four million six hundred and sixty thousand eight hundred and seventy) square feet, which, at the lowest probable rate, would amount to an outlay of \$2,000,000, of which a large part must be expended before any return, either for principal or interest, could be made. From time to time, as fast as filled to the proper grade, he proposed that the Commonwealth should deed to him the land to the west of B Street extended, amounting to 3,460,870 square feet, and retain 1,200,000 feet to the east of the same street. The amount demanded was large and embraced that part of the property that would first come into the market; but as it was the only bid, the Commissioners had contracts carefully drawn and submitted them to the governor and council.

By this contract, Mr. Munson agreed that the Board might at any time *alter or cancel* the contract, and his damages were to be assessed by the governor and council without appeal. The Commonwealth could, it was believed, under this contract, protect itself against any improper or unreasonable use of the territory to be acquired by the contractor.



The Board would have been happy if other competitors had enabled them to make a better bargain for the Commonwealth ; but having an opportunity of making a contract that would insure the immediate commencement and final completion of a work that would benefit, incalculably, the harbor of her capital, and add millions to the taxable property of the State, they were unwilling to take the responsibility of risking the whole on the contingency of their being able to make another bargain with the Boston Wharf Company, or getting another contract on better terms, especially as these contracts related to less than a seventh of the seven hundred and fifty acres in this locality belonging to the Commonwealth.

The several contracts were referred to a committee of the honorable council who reported on them as follows: "A contract with the Boston Wharf Company, by which it is proposed to compromise the conflicting claims of title to certain flats between the Wharf Company and the Commonwealth, by a partition of the territory in dispute, and a conveyance from each party to the other of certain specified portions thereof, with further provisions as to sea-wall and filling—this contract, the committee believe to have been wisely made, and that a settlement thus early to be accomplished will prove beneficial to both parties. But we are advised by the Harbor Commissioners that the contract is, in certain particulars, so connected with, and dependent upon, the other proposed contracts, that unless they shall be approved, some modifications will be necessary to make this contract practicable. In view, therefore, of the conclusion to which we have arrived with reference to the others, we recommend the return of this contract to the Harbor Commissioners for further negotiation with the company.

"There are two contracts with the Rockport Granite Company and Messrs. Clapp & Ballou for building sea-walls ; one upon Fort Point Channel and the other upon or near the exterior line of the harbor as recommended by the United States Commissioners. These contracts appear to have been well made, the work required substantial, and the prices to be paid reasonable. These, also, in a measure depend upon the Munson contract hereinafter named, and cannot be approved unless that is approved.

“A contract with Mr. N. C. Munson, which provides for filling 4,665,000 square feet or more than one hundred acres, of flats, extending from Fort Point Channel and lands of the Boston Wharf Company on the west to a line about seven hundred feet easterly from B Street extended, and substantially parallel therewith. For filling this territory the contractor is to take for his compensation all the land lying between said channel and land of the Wharf Company on the west, to the line of B Street extended, amounting to 3,465,000 square feet, or, in round numbers, seventy-nine and a half acres. And the Commonwealth, as its share in the contract, a strip of filled land, about 700 feet wide on the easterly side of B Street extended, containing 1,200,000 square feet, or about twenty-seven acres.”

After an able discussion of the probable value of the land which would be conveyed to Mr. Munson “a majority of the committee were of opinion that these contracts should be disallowed, in the hope that the Harbor Commissioners will yet be able to present others, more advantageous to the Commonwealth.”

This report was accepted and the contracts disallowed and returned to the Commissioners on the 30th day of November.

The Commissioners advertised again for proposals for the filling or purchase of the flats, returnable on the 19th day of December, but without success, no bid whatever having been made.

Since the last advertisement they have been informed that some of the railroads have appointed committees to consider the subject of obtaining freight accommodation on these flats, and the Commissioners hope by negotiation with the various parties to submit a new contract for filling which will obviate the objections made to the former.

#### STRUCTURES OVER TIDE-WATERS.

By authority of section 4, chapter 149 of the Acts of the year 1866, which provides that all persons who have been or may be authorized by the legislature to build over tide-waters any bridge, wharf, pier or dam, or to fill any flats, or to drive any piles below high-water mark, who have not already begun such work, shall, before beginning it, give notice in writing to the

Harbor Commissioners of the work they intend to do, and no such work shall be commenced until the plan and mode of performing the same shall be approved in writing by a majority of the board,—the Commissioners have carefully examined and approved plans for the following structures :

The extension of a pile wharf in the harbor of Gloucester by Parker Burnham and Elias Burnham, under the authority of chapter 190 of the Acts of the year 1867.—*Approved January 9.*

The extension of a pile wharf in the harbor of Gloucester, by Alfred Low and Company, under the authority of chapter 190 of the Acts of the year 1867.—*Approved January 9.*

The construction of a solid wharf and a pile wharf in the harbor of Gloucester, by George H. Rogers, under the authority of chapter 190 of the Acts of the year 1867.—*Approved January 9.*

The construction of a pile wharf on the easterly side of the East Chop of Holmes' Hole Harbor, under the authority of chapter 37 of the Acts of the year 1866.—*Approved February 21.*

The construction of three pile wharves in the harbor of Chilmark, under the authority of chapter 196 of the Acts of the year 1867.—*Approved March 19.*

The extension of a wharf in the harbor of Hingham, by Harvey T. Litchfield, under the authority of chapter 262 of the Acts of the year 1867.—*Approved March 19.*

The location and plan for construction of connecting tracks by the Eastern and Fitchburg Railroad Corporations near their present intersection in the city of Charlestown, under the authority of chapter 335 of the Acts of the year 1867,—compensation to be made for tide-water displaced by solid filling or pile structures.—*Approved July 31.*

The extension of a solid wharf and pile wharf in the harbor of Gloucester, by the Gloucester Gas Light Company, under the authority of chapter 190 of the Acts of the year 1867.—*Approved August 6.*

The extension of a pile wharf in the harbor of Gloucester, by Andrew W. Dodd, under the authority of chapter 190 of the Acts of the year 1867.—*Approved August 6.*

The extension of a pile wharf in the harbor of Gloucester,

by Sylvanus Smith and Addison Gott, Jr., under the authority of chapter 190 of the Acts of the year 1867.—*Approved October 22.*

The extension of a pile wharf in the harbor of Gloucester, by Robert Tarr, 2d, and James Tarr, Jr., under the authority of chapter 190 of the Acts of the year 1867.—*Approved October 22.*

The extension of a pile wharf in the harbor of Gloucester, by William Parsons, 2d, under the authority of chapter 190 of the Acts of the year 1867.—*Approved November 23.*

The extension of a pile wharf in the harbor of Gloucester, by Wm. C. Wonson, under the authority of chapter 190 of the Acts of the year 1867.—*Approved November 23.*

Considerable difficulty was experienced in establishing the boundaries of the two last named structures so as to harmonize the interests of the riparian proprietors on Coo's Cove. The Board instructed their engineer to prepare a plan for the extension of the wharves in this cove, in such manner that the riparian owners in said cove, except James Davis, whose land was too narrow for the construction of a wharf, could have equal proportionate rights of advancing with wharves towards said harbor line, and that provision should be made for convenient access to such wharves and the land of said Davis and other riparian owners, by docks of proper width and length, and make report to the Board. His plan was adopted. The method pursued by him in making this plan, we consider of so much importance and applicable to so many cases, that we annex his report in the Appendix.

It will be observed that the Board have assumed that they have the right under the statute of determining that waterspaces for docks shall be reserved between the extended wharves, although such reservations are not expressly provided for in the statute. Each shore owner has by the Act, the right of extending his wharf over any flats of the Commonwealth, that may lie between his outer lines and the harbor lines there now established, but in such manner that all persons affected by this grant may have equal proportionate rights of advancing to or toward the said harbor lines. We have assumed the right to provide docks, for the reason that unless there were docks reserved on these flats, there could not be wharves; the flats would be wholly covered over, while an occupation by *wharves* only is

what the statute authorizes. There is, however, still a question when the wharf is built and the dock reserved, what rights of wharfage or dockage the statute gives to the proprietor of the wharf, on the reserved water-space. None are given expressly by the statute, and we doubt whether any are given by implication. Beyond the limits of the wharf, the owner, it would seem, has no rights beyond those which he has in common with all other persons in open navigable waters. The proper use of wharf property requires, however, that rights of wharfage and dockage should be appurtenant to the right to maintain a wharf. We would recommend, therefore, legislation that shall define the rights of the owner of a wharf built under the provisions of this statute, to wharfage and dockage as appurtenant to his wharf.

#### EAST BOSTON BRIDGE.

In March last, the Commissioners deemed it their duty to call the attention of the Secretary of the Navy to the proposition then before the legislature to build a bridge to East Boston from the city proper. A plan of the harbor in front of the Navy Yard, showing the proposed location of the bridge, was forwarded to the Secretary; and after examining the subject he replied on the 13th of April, that "the construction of such a bridge would be a most calamitous act, so far as the navy was concerned, as it would be a great injury to the several government establishments lying above that locality—the Navy Yard, Navy Hospital, Magazine, and Shell-house, and the Nitre Depot at Malden. Already there are too many bridges and draws above the locality for the proposed bridge, which impede the passage of vessels. The dispatch of a United States vessel from the yard in case of emergency might be stopped for hours, and accidents to them in that thoroughfare would not be improbable. The department would feel compelled to oppose strenuously such a structure." The Board opposed the bridge at the hearings before the harbor committee of the legislature.

The aid of the city council of Boston was asked by the friends of the measure in support of the application for a charter; but the joint committee on the harbor, to whom the subject was referred, reported adversely to the committal of the city in behalf of the proposed structure, and their report was accepted.

On the eleventh of June the legislature passed the Act, over the governor's veto, to incorporate the Maverick Bridge.

As the ultimate authority over the matter is vested in the Congress of the United States, a joint resolution authorizing the Secretary of the Navy to detail three officers as a Commission to examine and report in relation to the erection of a bridge in Boston Harbor, was passed by Congress and approved by the President July 7th. On the first of September, Rear-Admirals S. H. Stringham and C. H. Bell, and Brevet Brigadier-General J. H. Simpson, of the Engineer Corps, were detailed by the Secretary, and commenced their examinations at the Navy Yard in Charlestown, on the 16th of September.

The Commission having applied to this Board for information and assistance in prosecuting their inquiries, Mr. Boschke, the engineer of the Board, prepared under its instructions a careful statement of facts bearing upon the subject and a plan of the location of the proposed bridge. His report and plan were submitted to the Commission, and at its hearings some members of the Board were present.

#### MISCELLANEOUS.

Certain inhabitants of the town of Ipswich having petitioned the last legislature for an Act to protect the harbor of Ipswich by restraining the removal of sand from "Sandy Point," so called, the subject was referred to this Board, in April last, by the harbor committee of the legislature, with a request to report whether any injury was caused to the harbor by the removal of sand. A hearing was given to the petitioners and remonstrants; and at the conclusion the Board directed their engineer to visit Ipswich and make such surveys of Sandy Point and the bars as he should deem necessary.

The engineer subsequently reported that a comparison of the present state of the entrance to the harbor with surveys made in 1855, indicated a continuous growth of the beach where the sand was taken away by vessels; and that he could not discover any injury resulting from such removal of sand to the harbor or anchorage. The Board subsequently reported to the committee of the legislature that no legislation was necessary.

In May, Mr. Henry Mitchell, a member of our U. S. Advisory Council, to whom the Board had been indebted for much

valuable information, being about to visit Europe on inquiries instituted by the Government Coast Survey relative to the improvement of harbors, was requested to communicate to us any information that he might gather, relative to the organizations, powers and labors of Boards similar to this, together with such other results of his inquiries as he might deem useful; and a circular letter was given by the Board to aid him in his purpose.

On the 6th of August, the Mystic Water Board of Charlestown submitted plans for laying an eight-inch water pipe across Mystic River on the upper side of Malden Bridge, for the purpose of supplying the Charlestown almshouse with water. Under the authority of chapter 212 of the Acts of the year 1866, the plans were approved by this Board.

The city of Charlestown having been authorized by an Act of the last legislature (chapter 253,) to fill up, under the direction of the Harbor Commissioners, the flats known as the "flats in Prison Point Bay," upon making compensation, from time to time, for the amount of tide-water displaced by the filling, the same to be ascertained by the Harbor Commissioners, the mayor of Charlestown made application to the Board, in July last, for information as to the amount which would be required.

In reply, it was stated that the Board would require the city of Charlestown to pay thirty-seven cents for every cubic yard of tide-water displaced in filling flats; or, if the city preferred, compensation might be made by dredging, between high and low-water mark, an amount of material equal in bulk to the tide-water displaced—the dredging to be done under the direction of this Board, at places pointed out by its engineer in the basin between the Boston and Maine and Eastern Railroads, and in the basin between East Cambridge Bridge and Brookline Bridge.

In December the Fitchburg and the Boston and Maine Railroad Corporations petitioned this Board to approve plans which they submitted for widening their bridges over Charles River for the purpose of making proper connections with the Marginal Freight Railway Company. After a full hearing on the subject the Commissioners were of the opinion that the petitioners had received no authority from the legislature to build any struct-

ure over tide-waters in Charles River below low-water mark, and gave them leave to withdraw.

Much time was spent by the Commissioners during the session of the legislature of 1868 in attendance upon the Harbor Committee, agreeably to its request.

We would recommend that the legislature provide that rights in tide-waters in the Upper Harbor of Boston shall be acquired only by an express and never by an implied grant in legislative Acts. The most careful scrutiny of bills before the legislature often fails to detect important encroachments upon the public domain which the face of the measures does not disclose. A legislative rule of construction, such as is proposed, would remedy this evil.

Major-General H. W. Benham and Major-General J. G. Foster, U. S. Engineers in charge of the works that are being carried on in Boston Harbor and Cape Cod Harbor under the authority of the United States, have favored this Board with copies of their respective official reports to Major-General A. A. Humphreys, Chief of Engineers. These reports are hereto appended.

We congratulate the Commonwealth that the works in Boston Harbor, though uncompleted, have already secured for it great and obvious advantages. Among the benefits thus conferred on the harbor, we may mention that the Tower and Corwin Rocks, lying directly in the main ship channel, have been entirely removed, and that this great highway of commerce has also been widened and greatly improved by dredging away the south-west point of Lovell's Island.

It is not for us to speak of the highly successful accomplishment of the important work in Cape Cod Harbor assumed by the Commonwealth, as the Commissioners having it in charge will report upon it. General Foster's report affords interesting information of the work done in that harbor by the United States.

In June last one of the Commissioners visited Washington in order to secure a continuance of the necessary appropriations for Boston Harbor; of the general appropriation by Congress for the prosecution of works in progress, the sum of \$40,000 was devoted by the War Department to the works in Boston Harbor.



This Board has recently addressed a memorial to Congress urging the necessary appropriations to complete the harbor improvements above referred to.

The Harbor Commissioners report with great regret the resignation of Albert Boschke, Esq., who has been their engineer from the first organization of the Board. His great engineering skill and familiarity with the subjects upon which the Commissioners are required to act, his sound judgment on all scientific and practical questions submitted to him, as well as his great zeal and industry in the service, render his withdrawal from the office a great loss to the Commonwealth.

JOSIAH QUINCY,  
S. E. SEWALL,  
WILLIAM MIXTER,  
F. W. LINCOLN, JR.,  
DARWIN E. WARE,

*Board of Harbor Commissioners.*

MEMORANDUM.—Since this Report and the annexed plan were prepared, the Board has received from the Boston Wharf Company the following notice: “that as the governor and council have not ratified the contract made between you and the Boston Wharf Company, dated August 12, 1868, the Boston Wharf Company withdraws from said agreement and requests that the papers may be returned for cancellation.”





## APPENDIX.

HARBOR COMMISSIONERS' OFFICE, }  
BOSTON, November 23, 1868. }

HON. JOSIAH QUINCY, *Chairman of Board of Harbor Commissioners.*

SIR:—I have the honor to report the principles upon which, in accordance with the instructions of the Board, I have divided the Commonwealth's flats granted for occupation by wharves to the riparian owners of Coo's Cove in Gloucester Harbor, by chapter 190 of the Acts of the year 1867, and respectfully submit the plan of division for your approval. The rule of the supreme judicial court heretofore applied to the division of flats situated in coves and within the line of riparian ownership is not applicable in this case, since the owners of the two headlands would not receive, what the statute under which rights of occupation are granted would entitle them to, under the provision, that "all persons affected by this grant shall have equal proportional rights of *advancing to or towards* the said harbor lines." This equal proportionate right of advancing, can only be obtained by setting off to each riparian owner an equal proportionate area of the Commonwealth's flats. I endeavored, therefore, to divide the whole area between the low-water line and the harbor commissioners' line into equal proportionate parcels, in proportion to the length upon the low-water line, which the supreme judicial court has decided that each party is entitled to. To accomplish this, I adopted the following method:

If the shore is assumed to be a straight line and the low-water line is parallel thereto, the division lines of the flats between the respective shore owners, would be lines perpendicular to the shore line, and each owner would have with mathematical correctness, by such lines, proportionate rights of advancing from the shore line to the low-water line. As we can assume that a cove of ever so irregular a form, consists of a great number of straight lines of small dimensions, the above rule can be applied to any case and will find its extreme application in the circle.

The practical application of the above rule in this case at Gloucester, I made by drawing lines 20 feet distant from each other,

parallel to the low-water line or limit of riparian ownership and over the whole of the Commonwealth's flats within the harbor commissioners' line, and divided the first of these auxiliary lines in the same proportion as the riparian owners own upon the low-water line; this divides the first belt of 20 feet wide and gives each owner a proportionate right of advance for the first 20 feet. Then I divided the second auxiliary line 40 feet distant from the low-water line, into the same proportional parts as the first auxiliary line,—the line 20 feet from the low-water line; this divided the second belt in equal proportionate parts in the same manner as the first belt; and so on, I made belts and divided them, until I reached the limit of the cove or flats as defined and bounded by the harbor commissioners' line. In connecting all the points of division upon the auxiliary lines, we obtain lines of division between the parties. It is apparent that the lines of division of irregular shores can only be irregular lines, and so not suitable for boundary lines of wharves; a straight line being desirable. It only remained to establish such a straight line by setting off to the one or the other party such equal areas, which the intersection of a straight line with an irregular line would give or take from the one to the other party on each side of the straight line.

This process gives all persons "equal proportionate rights of advancing to or towards the harbor lines," and is applicable in all cases that may hereafter arise.

The instructions of the Board further require that provision shall be made for convenient access to such wharves and the land of Davis and other riparian proprietors, by docks of proper width and length.

By the accompanying plan you will perceive, that I have drawn the limits and direction of the wharves upon the equitable ground, that each owner of the flats, as divided between them in the above described manner, should contribute an equal area towards the formation of suitable docks or slips. In the present instance, this admits of the construction of three large wharves and two commodious docks. The fourth party, Mr. James Davis, will not be able to advance to the harbor lines with his wharf, as he owns only 10 feet upon the low-water line. He will however, have ample access to his premises by the dock between the wharves of Wm. Wonson and Wm. Parsons, 2d.

Most respectfully,

Your obedient servant,

A. BOSCHKE.

## IMPROVEMENTS IN BOSTON HARBOR.

## GEN. BENHAM'S REPORT.

[COPY.]

BOSTON, MASS., Jan. 11, 1869.

Major-Gen. A. A. HUMPHREYS, *Chief of Engineers.*

*General:*—I have the honor to make the following Report in relation to works on the sea-walls for the protection of the principal islands in this harbor, during the past season of 1868.

*At Deer Island.* The walls of the south and middle heads having been rebuilt in 1866-7;—during the last season work was commenced on the north head wall, which is about eighteen hundred feet long. The whole of this work was put under contract, and eight hundred feet of it finished during 1868. The remaining one thousand feet will probably be completed this year, 1869, and, when finished, will entirely protect this island, as far as now appears necessary, and secure it against encroaching on the main ship channel at Deer Island Spit, where the most danger is now apprehended.

*At Lovell's Island.* A wall ten feet high including foundation, and about eight hundred feet long has been entirely finished, with the necessary jetties for its security at the angles, during the last working season. This wall protects the south-east bluff of the island, and, as soon as the coming season will permit, work will be recommenced on the few repairs needed for the wall at north-west head, originally built in 1843. These repairs being finished, no further protection will probably be needed to this island, and it is hoped it will be secured against any farther encroachments upon or towards the "Narrows" of the main channel.

*At Great Brewster Island.* The north and south head walls as originally planned, were completed in previous years, with the exception of the earth filling and paving in rear of the north head wall. This filling and paving was nearly completed during the year 1868, and a dry masonry wall about six feet high has been laid in the

gap between the north and south heads, to serve as a temporary protection until an appropriation is available to close this gap, (as is now recommended,) by a wall similar to the others, which I trust will fully guard against the danger now feared, that the island may be cut in two by any unusual violence of the sea, over the lowland between the two heads.

The funds now available will probably complete the north head wall at the rear, as proposed, and when the gap above-mentioned is finally closed, this most exposed island will be fully protected, and it is hoped there will be no farther increment to the Great Brewster Island Spit, near Fort Warren.

From the above it will be seen that these three most important works upon islands situated so near, and, by their abrasion of so much danger to the main ship channels, are already well advanced towards completion, and that another working season will probably suffice for all the operations needed upon them, if the funds now asked for, for the Great Brewster Island, (\$25,000,) shall have been granted by Congress during the present session.

Very respectfully your obedient servant,

(Signed,)

H. W. BENHAM,

*Brevet Major-General.*

## GEN. FOSTER'S REPORTS.

BOSTON, MASS., January 9, 1869.

Hon. JOSIAH QUINCY, *Chairman of Board of Harbor Commissioners of the State of Massachusetts, Boston, Mass.*

*Dear Sir:*—In accordance with your request, I inclose herewith copies of my reports to Brevet Major-Gen. A. A. Humphreys, Chief of Engineers, U. S. A. as follows:—

1st. Report for the fiscal year ending June 30, 1868.

2d. Brief Report of operations for the year ending December 31, 1868.

3d. Special Report on Provincetown Harbor, dated December 21, 1868.

These give all the main points of information relative to the works of harbor improvements carried on by the general government in this State under my charge.

Very respectfully your obedient servant,

J. G. FOSTER, *Brevet Major-Gen. U. S. A.,  
Lt.-Col. Engineers.*

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[COPY.]

BOSTON, MASS., Sept. 5, 1868.

Brevet Major-Gen. A. A. HUMPHREYS, *Chief of Engineers, H. Q.  
Corps of Engineers, Washington, D. C.*

*General:*—I have the honor to make the following Report of progress in the works of harbor improvement under my charge during the fiscal year ending the 30th of June, 1868.

*Preservation and Improvement of Boston Harbor.*

As soon as the preliminary surveys were completed, proposals were invited for dredging the south-west point of Lovell's Island, for dredging the channel across the upper middle bar, and for blasting and removing the rocks in the Narrows between the light on the west extremity of Great Brewster Spit and Fort Warren.

The contract for dredging the south-west point of Lovell's Island was awarded to Mr. Albert Boschke, the lowest bidder. Under his contract the work has been prosecuted with vigor, and 92,899 cubic yards of dredged material removed, widening the channel at that



point to 600 feet at the 13 foot curve, and to an average depth of the dredged area of thirteen feet at mean low water. A larger and more powerful dredging machine is now being built by Mr. Boschke intended to carry the depth over this dredged area to twenty-three feet at mean low water, the depth required by contract and by the requirements of navigation. It is also proposed to dredge off a portion of the extreme south point of Lovell's Island and the edge of the shoal on the east side of Gallop's Island, directly opposite Lovell's Island.

Total amount expended during the fiscal year ending

June 30, 1868, . . . . . \$46,258 02

Probable amount to be expended during the fiscal year

ending June 30, 1869, . . . . . \$42,741 98

Amount required to complete the widening of the channel at this point to 685 feet and a depth of 23

feet, the width and depth desired and estimated for

by the Board of Harbor Commissioners, . . . . . \$99,805 00

The contract for dredging the upper middle bar was awarded to Mr. Charles Woolley, one of the two lowest bidders, preference being given to him as he was a resident of Boston and had the necessary dredging machine on the spot to prosecute the work at once. After a brief attempt of a part of one day to perform the work, Mr. Woolley abandoned it, and refused to comply with the terms of his contract in prosecuting it in any manner or even paying the forfeited amount of his sureties. The contract was then given to Mr. Wm. W. Wright, of Geneva, N. Y., the other bidder, who gave the requisite sureties for the performance of the work. As, however, he had previously been notified that the contract had been awarded to Mr. Woolley, he had in the mean time disposed of the dredging machine with which he proposed to do the work, and was unable afterwards to procure a dredging machine in time, and has transferred his contract to Mr. Albert Boschke of this city. The work was not commenced on the 30th of June, 1868.

Amount expended during the fiscal year ending June

30th, 1868, . . . . . \$3,454 11

Probable amount to be expended during the fiscal year

ending June 30, 1869, . . . . . \$35,545 89

Amount required to complete the dredging at this point to a depth of 23 feet at mean low water and a width

of 1,000 feet as estimated for by the Board of Harbor

Commissioners, . . . . . \$118,085 00

*Blasting and removing Tower and Corwin Rocks.*

The work has been successfully carried on under the direction of Mr. Geo. W. Townsend, contractor, and has resulted in the entire removal of "Tower Rock" to a depth of 23 feet at mean low water, and the entire removal of "Corwin Rock," and the adjacent ledge lying between "Corwin Rock" and Fort Warren, to a general depth of 22 feet at mean low water, and over the larger portion of its surface to 23 feet at mean low water.

Six hundred and fifty tons of rock have been blasted from these rocks, hoisted up, and deposited on shore. Many tons of small fragments that were thrown into deep water by the explosion of the blast were suffered to remain on the bottom, where they in no way interfered with navigation.

The amount available will, it is expected, nearly complete the entire removal of these rocks heretofore so dangerous to navigation.

Amount expended during the fiscal year ending June	
30, 1868, . . . . .	\$20,842 25
Probable amount to be expended during the fiscal	
year ending June 30, 1869, . . . . .	9,157 75

*Sea - Wall at Point Allerton.*

As there were no funds available for the purchase of the site necessary for the construction of this wall, application was made, by the engineer in charge, to the legislature of the Commonwealth of Massachusetts, for the appropriation of the sum necessary to purchase the strip of ground near high water upon which to build the wall, together with the shoals in front and the necessary slope in rear, to be presented in fee simple to the United States. The necessary sum—one hundred and seventy-five dollars—was appropriated at the last session, and is now available.

As soon as the necessary examination of title can be made, the purchase and transfer to the United States will be completed, after which the work may be commenced, as agreements have already been made for the rent of the portion of the adjoining land necessary to be used in the construction of the wall.

Amount expended during the fiscal year ending June	
30, 1868, . . . . .	\$4,889 52
Probable amount to be expended during the fiscal	
year ending June 30, 1869, . . . . .	45,110 48
Amount required to complete the work, . . . . .	20,991 87

*Sea - Wall for the Preservation of Gallop's Island.*

Upon application of the engineer in charge, the city of Boston, which owns this island, presented to the United States the strip of ground upon which to build this wall, with the shoals in front and slopes in rear, and also gave permission to use the necessary amount of land, temporary buildings, wharf, &c., required in the construction of the wall.

Contracts for the material and work were entered into in the month of May, a cement house was built, the necessary temporary buildings for use of laborers removed to the site, and all preparations completed for the commencement and rapid prosecution of the work.

The contracts for the workmanship and for the granite for this wall were awarded to Mr. James Andrews, of Biddeford, Maine, the contracts for the sand and cement to Messrs. T. W. Hoxie & Co., and for the broken stone for concrete to Mr. Franklin Mead, of Boston.

Amount expended during the fiscal year ending June 30, 1868, . . . . .	\$5,647 16
Probable amount to be expended during the fiscal year ending June 30, 1869, . . . . .	44,352 84
Amount required to be appropriated for the fiscal year ending June 30, 1870, to complete the work, . . . . .	53,585 63

*Sea - Wall for the Preservation of the North Head of Long Island.*

The negotiations for the purchase of the north head of this island, with the lowland adjacent, for military purposes, having failed to obtain a favorable result, the officer having it in charge, Brevet Major-General H. W. Benham, was ordered to co-operate with Brevet Major-General J. G. Foster, in the effort to obtain from the legislature of the Commonwealth the passage of a law providing for the acquisition of the titles to the necessary land by the United States.

Application was accordingly made, and was successful in obtaining the passage of a law providing for the determination of the price to be paid by the United States, by means of the jury of the superior court of the county, and the vesting of the titles in fee simple in the United States, upon the deposit of the sum so determined in the hands of the judge of the court. Application will be

made to the court at its next session, and as soon as the titles are thus secured the sea-wall may be commenced.

Experiments upon various kinds of materials for pavements in rear of the coping of sea-walls were carried on during the winter, and reported upon in a special report.

Amount expended during the fiscal year ending June 30, 1868,	\$7,674 54
Probable amount to be expended during the fiscal year ending June 30, 1869,	67,325 46
Amount required to be appropriated for the fiscal year ending June 30, 1870, to complete the work,	75,00 00

*Preservation of Provincetown Harbor, Cape Cod, Mass.*

Under the charge of Colonel H. W. Benham, Brevet Major-General U. S. A., until June 22, 1868, since then of Lieutenant-Colonel J. G. Foster, Brevet Major-General U. S. A.

At Long Point, the aproning of stone near the light-house has been extended to the eastward during the summer. Several hundred tons of stone have thus been deposited with favorable result, as they maintain their position and afford an efficient protection to the beach.

At Beach Point, preparations are being made to repair the injuries done to that narrow strip of beach by a storm in April of this year. Plans of a brush bulkhead and jetties for this purpose, and for the protection of the beach towards the inlet to East Harbor, have been prepared, and advertisements inviting proposals for the construction of the same will shortly be published.

As fears are entertained by many of the inhabitants that the encroachments of the sea upon the outer or sea beach may result, during some great storm, in the formation of a breach through the sand-ridge into East Harbor, preparations are being made by the present engineer in charge for the construction of a dike across the salt meadows and East Harbor Creek, at a place called the "wading place," opposite "High Head."

The observations for determining the tides and currents and the nature and extent of the changes in Provincetown Harbor, under the immediate direction of Captain George Burroughs, Brevet Major U. S. A., will be carried on diligently by that officer, under the appropriation for "*Examinations and Surveys on the Atlantic Coast.*"

Amount expended from appropriation for preservation of Provincetown Harbor for the fiscal year ending June 30, 1868, . . . . .	\$6,542 42
Probable amount to be expended during the fiscal year ending June 30, 1869, . . . . .	36,751 26
Amount required to be appropriated for the fiscal year ending June 30, 1870, to complete the work, . . . . .	20,000 00

It is difficult to estimate the expense necessary for the permanent completion of the works for the preservation of Provincetown Harbor, as they necessarily change with every new cause of injury and the effect of violent storms.

I have also the honor to report upon the points called for in Engineer Circular of June 15, 1868, as follows, viz. :—

1st. The plan adopted for the works of preservation and improvement of Boston Harbor is substantially that of the Harbor Commissioners of the Commonwealth of Massachusetts, which have met the general approval of the Chief of Engineers.

The items of this plan are as follows, viz. :—

For dredging a channel across the Upper Middle Bar 1,000 feet in width and to a depth of 23 feet at mean low-water, at a total estimated cost of . . . . . \$157,085 00

For dredging off the S. W. point of Lovell's Island and the extremity of Great Brewster Spit so as to widen the channel to 685 feet at the 18 feet curve, and to carry the dredging to the depth of 23 feet at mean low-water mark, at a total estimated cost of 188,805 00

For the removal by blasting of "Tower Rock" and "Corwin Rock" to a depth of 23 feet at mean low-water, at a total estimated cost of . . . . . 20,000 00

For the construction of a sea-wall around the north head of Long Island, at an estimated cost of . . . 150,000 00

For the construction of a sea-wall around the north end of Gallop's Island, at an estimated cost of . . . 103,585 00

For the construction of a sea-wall around the extremity of Point Allerton, at an estimated cost of, . . 70,991 87

Total for the preservation and improvement of \_\_\_\_\_

Boston Harbor, . . . . . \$690,467 50

The result of re-survey and actual work of removal have shown that the cost of removing "Tower" and "Corwin" Rocks by blasting to the required depth will exceed the sum of \$30,000.00.

Also that the western extremity of the Great Brewster Spit has ceased to extend itself into the channel, and that the removal of "Tower" and "Corwin" Rocks will render unnecessary the dredging off the extremity of the Spit.

Also that the cut at the south-west point of Lovell's Island should be extended, at the depth of 23 feet, entirely along that side of the island parallel to the axis of the channel, and that a similar and parallel cut should be made on the opposite side of the channel from the shoal on the north-east side of Gallop's Island.

2d. The amounts that are required for the entire and permanent completion of each work of preservation and improvement under my charge are given in the previous paragraph No. 1, with the exception of the removal of Tower and Corwin Rocks, which will cost \$35,000.00.

3d. The amount that can profitably be expended upon each work during the fiscal year is as follows, viz.:—

*In Boston Harbor.*

For the sea-wall at the north head of Long Island, .	\$75,000 00
" " " Gallop's Island, . . . . .	34,000 00
" " " Point Allerton, . . . . .	21,000 00
For dredging the south-west point and south-west side of Lovell Island and the north-east side of Gallop's Island, . . . . .	99,805 00
For dredging the Upper Middle Bar, . . . . .	118,085 00
For blasting and removing Corwin Rock, . . . . .	15,000 00

*In Provincetown Harbor, Cape Cod.*

For the protection of the beach of Long Point, .	\$10,000 00
" " " Beach Point, . . . . .	20,000 00
" construction of the dyke at the wading place, .	8,000 00

4th. The works in Boston Harbor are in the collection district of Boston and Charlestown, Massachusetts.

5th. The works in Boston Harbor are in the port of Boston, Massachusetts. Those at the Narrows are near Fort Warren, those at the Upper Middle Bar are near Fort Independence, those at Point Allerton near Boston Light-House, and those on Long Island near Long Island Light-House.

The works of preservation in Provincetown Harbor, Cape Cod, are located: those at Long Point near Long Point Light-House,

and those at Beach Point and in the salt meadows are about equally distant from the latter Light-House and Cape Cod Light-House.

6th. The amount of revenue collected at the port of Boston during the fiscal year ending June 30, 1868, as communicated to me by the collector of the port of Boston, Judge Thomas Russell, is \$15,974,581.34.

The amount collected at the port of Provincetown, as communicated to me by the officer of customs, Mr. Isaiah Gifford at Provincetown, is \$5,324.61.

The collector of the port of Boston informs me that the amount of commerce and navigation that will be benefited by the works of improvement in this harbor will be as follows, viz. :—

Whole number of vessels that enter and leave by the channel through the Narrows annually, 24,000.

Amount of tonnage during the fiscal year ending June 30, 1868, was as follows, viz. :—

Tonnage entered from foreign ports, . . . . .	731,930
“ “ “ domestic ports, . . . . .	956,123
“ cleared for foreign ports, . . . . .	689,822
“ “ “ domestic ports, . . . . .	1,243,846

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Total tonnage entered and cleared at Boston, . . 3,621,251

The amount of commerce to be benefited by the proposed improvement it is difficult to estimate, as no approximation can be made of the amount of the coasting trade; the imports and exports however are accessible, and amounted during the last fiscal year to the following :—

Total imports, . . . . .	\$37,039,771 00
“ exports, . . . . .	17,348,423 00

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Aggregate amount of foreign commerce, . . \$54,388,094 00

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I have the honor to be, very respectfully, your obedient servant,

J. G. FOSTER,

*Bvt. Maj.-Gen. U. S. A., Lt. Col. Eng'rs.*

[COPY.]

BOSTON, MASS., December 21st, 1868.

Bvt. Maj.-Gen'l A. A. HUMPHREYS, *Chief of Engineers, Headquarters Corps of Engineers, Washington, D. C.*

*General*,—Since the date of my annual report I have been able, by repeated inspections, to make more definite estimates of the amount required to be appropriated, at this session of Congress, for the protection and improvement of Provincetown Harbor, Cape Cod.

These will increase the amount required as estimated by me in my annual report, to \$30,000.00.

The several items of expenditure are as follows, viz.:—

For the extension of the bulkhead built for the preservation of the north end of Beach Point, along the embankment of the State Dyke to the north shore of the Inlet, (now closed,) being 700 running feet at \$6.00,	\$4,200 00
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For extending the brush bulkhead and jetties over the site of the plank jetties and bulkhead built by General Benham, being 1,200 running feet of bulkhead and 1,200 running feet of jetties 2,400 feet, at \$6.00,	14,400 00
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For completing the stone protection of Long Point from the Light House to the position of the large wooden jetties built by General Benham across the cove opposite the battery at the Light House, 1,200 tons, at \$3.00,	3,600 00
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For building a catch-sand, of brush and strips of board, across the marsh south-west of Provincetown, from Stevens' Point to House Point Island, and thence to the nearest point of Long Point, being 6,000 running feet at \$1.00,	6,000 00
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For constructing a brush bulkhead across the inner channel near Abel Hill, to prevent the flow of the high tide through from Lancy's Harbor to the inner harbor of Provincetown, being 600 feet at \$6.00,	3,600 00
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For planting beach grass upon the sand hills north of East Harbor and the salt meadow,	5,000 00
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\$36,800 00

Deduct the amount on hand after paying for the dyke at the "Wading Place,"	6,800 00
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Amount required to be appropriated,	\$30,000 00
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I would respectfully request that the above amount may be asked for, in view of the importance of this harbor, and of the efficient protection that the above works will give it.

I remain, General, very respectfully, your obedient servant,

(Signed,)

J. G. FOSTER,

*Bvt. Maj.-Gen'l U. S. A., Lt. Col. Eng'rs.*

[COPY.]

CITY HALL, BOSTON, MASS., Jan. 9, 1869.

Brevet Major-Gen. A. A. HUMPHREYS, *Chief of Engineers, Headquarters Corps of Engineers, Washington, D. C.*

*General*,—I have the honor to furnish, in accordance with your direction, the following brief statement of the progress of the works of improvement under my charge in this harbor during the year ending December 31, 1868.

At the south-west point of Lovell's Island the dredging has been continued by the contractor, Mr. Boschke, until the available appropriation became exhausted. About 92,000 cubic yards have been dredged and removed to the dumping ground.

The width of the channel between the 18 foot curve on the Gallop's Island side and the 13 foot curve upon the Lovell's Island side has been increased from 365 feet, its original width, to 625 feet, thus making a gain in width of 260 feet. This widening has already caused an increase in the current and volume of the ebb tide, which will prevent any further accumulation of debris at this point after being once removed.

The dredging was only carried to the depth of 18 feet at low water, as that was the effective working limit of the dredge in use. A new and more powerful machine has been constructed, and now is in this harbor, by means of which, as soon as the appropriation asked for becomes available, the depth over the whole dredged area will be carried to 23 feet at mean low water.

It is expected that this new machine will leave the bottom after dredging of an uniform level, and thus obviate the difficulty experienced in using dredges with buckets at the end of long arms, which are apt to allow the bucket to slide around rocks or hard lumps, and thus to leave ridges in the dredged surface. The new dredge, acting by a surface plough and continuous chain-buckets

which are held firmly to their line of work, is calculated especially to remedy this defect of the old dredges.

It is also proposed to dredge off a portion of the extreme southern point of Lovell's Island where it encroaches upon the channel, and also to remove the edge of the shoal on the east side of Gallop's Island, directly opposite Lovell's Island.

The amount asked for to complete these improvements is \$99,805.00.

*The Upper Middle Bar.*

The dredging of the centre of the channel at this point will be commenced at once, as the large dredge, built expressly for this work and for the dredging at the Narrows, is already in this harbor.

The sum available is sufficient to excavate a channel through this bar, 120 feet wide, to the depth of 23 feet at mean low water. A further appropriation has been asked for to complete the widening to 1,000 feet, as estimated for by the Board of Harbor Commissioners, of \$118,085.00.

*Sea-Wall for the Preservation of Gallop's Island.*

Upon application of the engineer in charge the city of Boston gave to the United States the strip of ground upon which to build this wall, and also the use of the temporary buildings for the occupancy of the workmen. Contracts for the work were entered into, the work commenced, and 350 feet of excellent sea-wall constructed during the season. The work will be continued next season to the limit of the present appropriation, and completed as funds become available from future appropriations.

*Sea-Wall for the Preservation of North Head of Long Island.*

The title to the site of this work not having as yet been secured, the work has not been commenced.

*Sea-Wall for the Preservation of Point Allerton.*

The legislature of the Commonwealth having appropriated the necessary amount to purchase the site for this wall for presentation to the United States, the purchase has been completed and the titles forwarded to the engineer department for approval.

As soon as this is received proposals will be advertised for and contracts made for the prosecution of the work in the coming season.

*Blasting and Removing Tower and Corwin Rocks.*

This work has been successfully carried on and completed by the contractor, Mr. George W. Townsend.

These two dangerous rocks, lying in the channel between Fort Warren and Great Brewster Spit Light, and *directly* in the channel, have been entirely removed to the depth of 23 feet at mean low water.

This work has been accomplished by submarine divers and by the use of a steam submarine drilling machine of ingenious and simple construction, invented for and used for the first time upon this rock. With its use the rocks have been drilled and blasted as though they were upon the surface. The fragments have then been hoisted on board of the working vessel, — the pieces being slung or packed in tubs by the divers, — and the whole deposited on shore.

Only the small fragments, too small to be of harm, were suffered to remain on the bottom around the rocks, where they had been blown by the blasts.

About 1,200 tons of stone have thus been taken off these rocks and deposited on shore.

The complete success achieved in the removal of Tower and Corwin rocks has directed attention to two other dangerous rocks in the entrances to this harbor, and requests have been made for their complete survey with a view to making estimates for their final removal.

These are "Barrel Rock" and "Kelley's Rock." The first of these lies  $1\frac{1}{4}$  miles east of Deer Island, directly in Broad Sound Channel, and, having only 4 feet of water upon it at low water, constitutes a dangerous obstruction to navigation, especially in foggy weather, which shuts out objects on shore from which bearings might be taken, and also conceals the buoy which marks the position of this rock until vessels are too near to avoid it. The second rock lies in the main ship channel between the Great Brewster Spit Light and Boston Light, about half a mile from the former, and has 17 feet of water upon it at low tide. It is in a very dangerous position, from the fact that vessels have to change their course opposite it, while if it were removed they could make a nearly straight course from Boston Light until opposite the Great Brewster Spit Light, which course would take them farther from the "centurian rocks," and of course much relieve them of the danger of running upon them in thick weather.

It was my intention to have made a thorough survey of both these rocks by submarine divers, but the work upon Corwin Rock was of longer duration than anticipated, so that its completion was not reached until December, when the lateness of the season and rough weather prevented the survey.

From careful inquiries of pilots and others, I am enabled to make the following estimate :—

For blasting and removing Barrel Rock, . . .	\$5,000 00
For blasting and removing Kelley's Rock, . . .	20,000 00

I respectfully request that these two items may be added in my annual report, and if it meets your approval, that the necessary appropriation may be asked for.

I have the honor to be, very respectfully,

Your obedient servant,

(Signed,)

J. G. FOSTER,

*Brevet Major-Gen. U. S. A., Lt. Col. Engineers.*

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